

Site Rite Annotations (B)

Ultrasound for vascular cannulation: general principles

The ultrasound probe used for vascular access is inferior to the probes used by the radiology department, which can usually provide better resolution, a longer usable depth, and the ability to detect flow in blood vessels, tumors, and fluid collections. It does, however, offer sufficient resolution and depth to identify vascular structures and to guide needle placement. The use of ultrasound by clinical practitioners has been demonstrated safe and has been shown to reduce the number of complications in jugular venous cannulation¹ and thoracentesis². It has been shown less useful for subclavian vein cannulation.³

Use of ultrasound to cannulate the internal jugular vein

Use of the ultrasound device to insonate the internal jugular vein prior to starting the procedure allows the practitioner to determine that:

- The vein is patent and compressible (not thrombosed or severely stenotic)
- The vein is located in the expected region-or is not! (approx 5-8% of the time, the internal jugular vein will be medial to the carotid artery)
- The direct path to the vein does not pass through the carotid artery.
- In addition to use of the ultrasound as a "scout" device, the ultrasound can be placed inside a sterile sheath and used to guide placement of the catheter in real time. This is more cumbersome and usually requires a second operator, but allows direct visualization of the entry of the needle into the vein.

Practical points to the use of the ultrasound

The ultrasound machines are kept in the utility rooms in each ICU. When the procedure is complete, the probe should be wiped down and the unit returned to the utility room.

Check the battery! The battery is in the back of the unit and is rechargeable. However, it is better for overall battery life to run the battery down and swap it out when discharged than to swap preventatively. A green indicator light on the front of the unit blinks when the battery is low. Ensure that a sterile sheath and jelly are available-you might decide that you want them even if at first you just want to use the machine to scout the terrain. Batteries and sheaths are in the supply area of ICU-W. A sterile glove can be substituted for a sheath if caution is used (the cable connecting the ultrasound probe to the machine can slide into the prepped area if not closely observed).

Scout the area before sterile prepping if time permits. This prevents you from wasting time and supplies sterilely prepping an unusable site. If there is no fluid to tap, or if the vein is thrombosed or very small, you will want to move to a more suitable site.

Use anatomic landmarks and physical exam to hone in on suitable sites. Spend some time getting the transducer in optimal position. The rib extending from the side of the transducer should point toward the person

doing the procedure. If it points away from you, the image will be reversed-hard to guide in a needle that way.

Venous anatomy: Compressibility is the hallmark of a patent vein. You cannot determine whether flow is present because Doppler is not part of the system. Arteries can be compressed as well, but will generally require a great deal more pressure and will remain circular in cross section long after veins have been flattened. Be sure to identify both the artery and vein! It is often not possible to see the tip of the needle entering a vein. It is, however, usually possible to see the needle compressing the soft tissue over the vein, and to see the release of that pressure as the needle "pops" into the vein. In this fashion you can guide the needle by making a "bouncing" motion while advancing toward the vein. The risk of a through and through puncture is reduced by this-which is nice when dealing with coagulopathic patients.

¹ Ultrasound guidance for placement of central venous catheters, a meta-analysis of the literature. Critical Care Medicine Dec 1996, 24(12) p2053-8.

² Complications associated with thoracentesis...Arch Int Med 1990 Apr, 150(4), 873-7.

³ Complications and Failures of Subclavian Vein Catheterization. N Engl J Med, Dec 29 1994, 331(26) p1735-8.